Biocidal products and their environmental exposure - an overview

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Overview

- Introduction
  - What are biocides?
  - Plant protection products vs. biocidal products

- Main part
  - Biocide application equipment
  - Potential of environment exposure
  - Measurement of environment exposure
    - Material and methods
    - Measured drift values

What are biocides?

Biocides:

- protect humans and animals against pests and vermin such as insects, mice and rats but also algae, fungi or bacteria.
- are used in many areas of private and work life.

What are biocides?

- 60 000 reported biocidal products in Germany.
- four main groups and 22 product-types
  - Disinfectants (human hygiene, veterinary hygiene, drinking water …)
  - Preservatives (film, wood and construction material preservatives …)
  - Pest control (insecticides, acaricides and products …)
  - Other biocidal products (antifouling …)

Pesticide

Plant protection products
Protection of the plant and plant products

Biocidal products
Protecting the health of humans and animals

herbicidal

growth regulator

sprout inhibitors

finishing agent

fungicidal

bactericidal

acaricidal

insecticides

rodenticides

molluscicidal

nematocidal

repellents

avicide

piscicide

anti-algae agent

antifouling

Plant Protection Act

Biocidal Product Regulation

Biocide application equipment (examples)

Control of oak processionary mot

s used for

No general inspection requirements for biocides equipment.
No information about their environment exposure.

Facade protection

Control of mosquitos

Control of wasps

Research project

Reduction of drift in spray application of biocides - Derivation of risk reduction measures and device requirements

Main focus: Control of oak processionary moths

- **Cannon sprayer**, UAV und helicopter
- Oak as **solitary tree, forest edge and avenue**
- Goal: Determination of reliable exposure data
- Duration: 01.08.2016 - 30.06.2019

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Material and methods
- Experimental investigation -

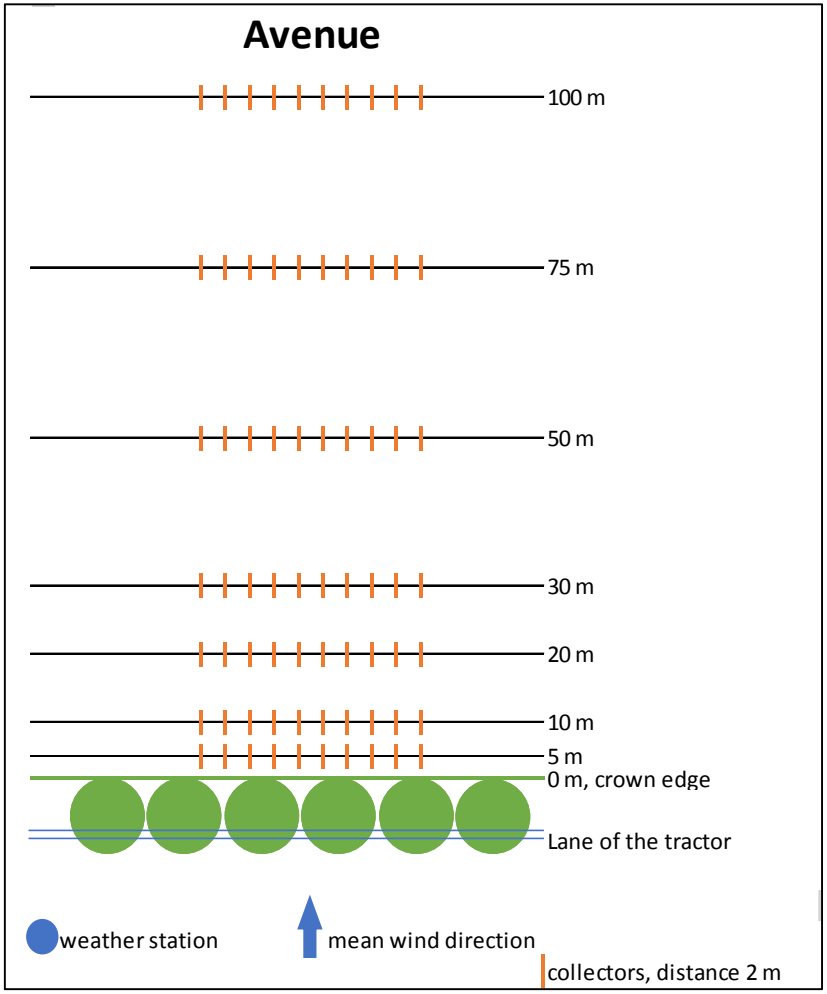
Conditions according JKI-guideline 7-1.5

- Trial area: treated area and measuring area
- Tracer: Pyranine 120%
- Concentration: 0.5% solitary tree
  0.2% avenue, forest edge
- Collectors: petri dishes
- Temperature: under 25 °C
- Wind speed: between 1 and 5 m/s
- Wind direction: rectangular to drive path +/- 30 °
- Measuring distance: 5, 10, 20, 30, 50, 75 and 100 m (where possible) from the treated area

Collector to collect the drift as ground sediment
(© JKI|Kanne-Schludde)

Material and methods

- Trial area: avenue -

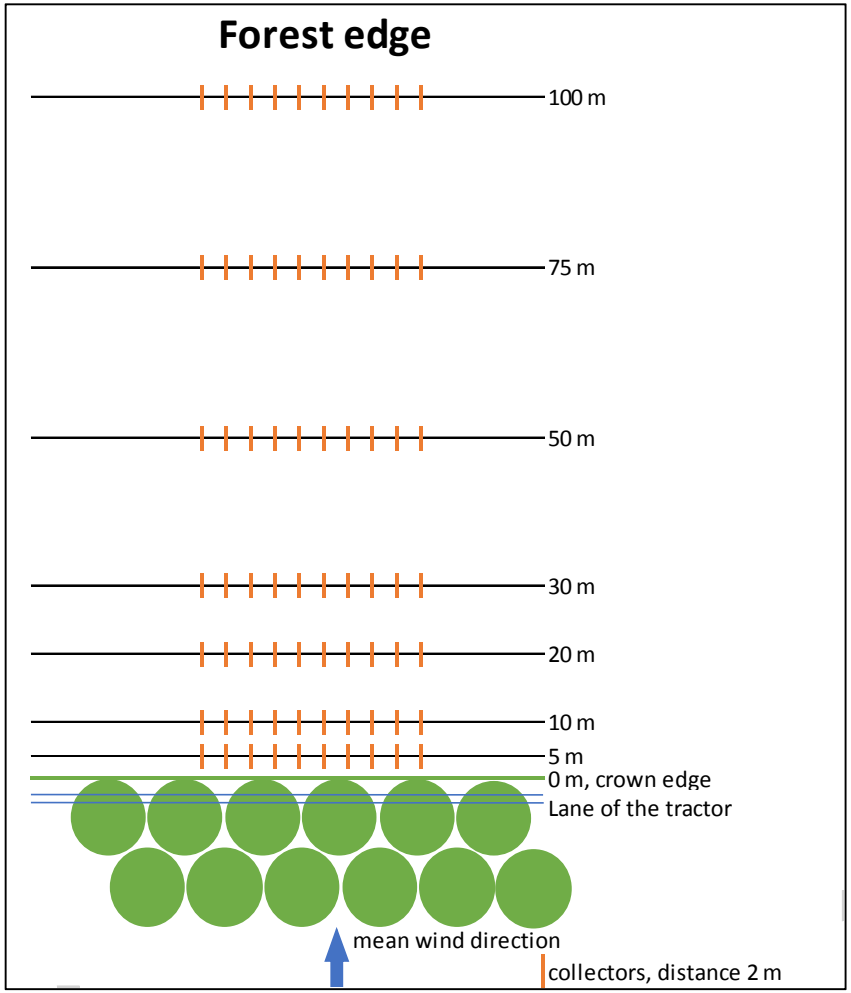


- single row of oaks
- drove at the windward side
- sprayed the liquid into the crown

Trial area according JKI-guideline 7-1.5 and application area avenue (© JKI|Kanne-Schludde)

Material and methods

- Trial area: forest edge -

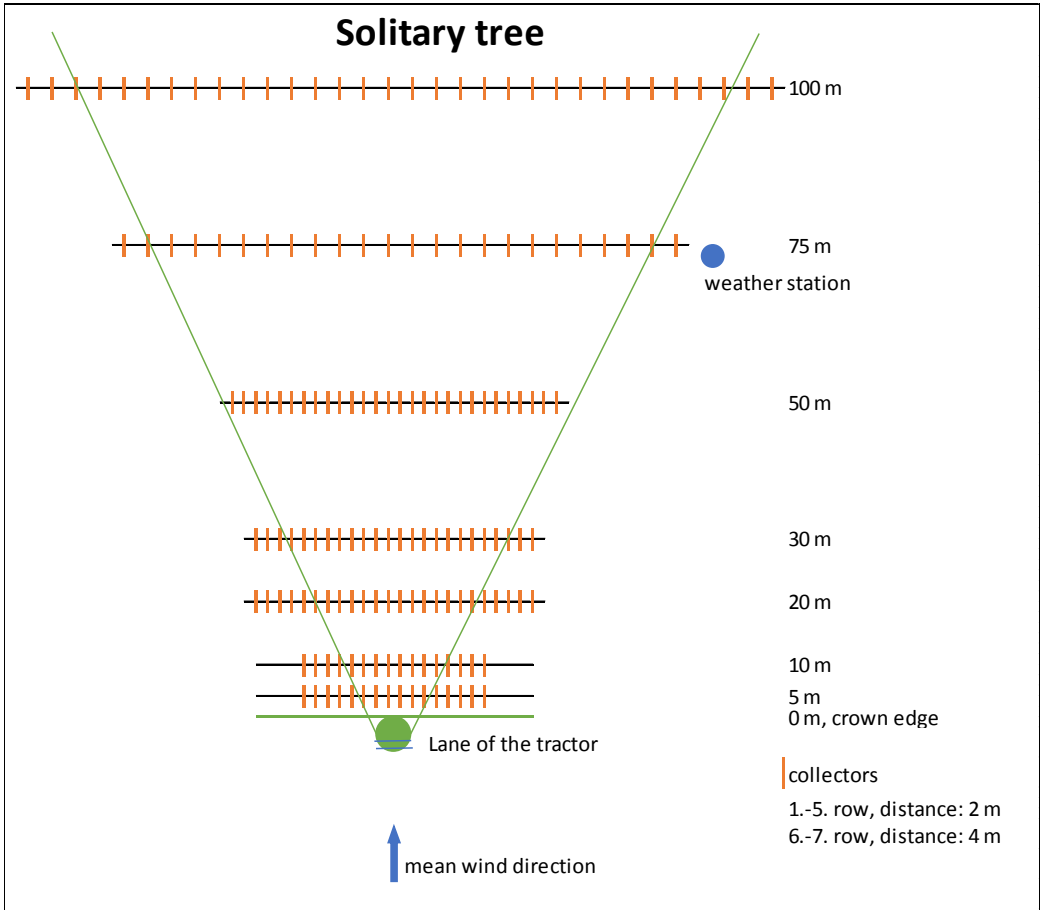


- tractor lane was on the wind away side
- sprayed the liquid into the crown against the wind direction

Trial area according JKI-guideline 7-1.5 and application area forest edge (© JKI|Kanne-Schludde)

Material and methods

- Trial area: solitary tree -



- sprayed the liquid directly into the crown
- treated area smaller than measuring area
- collect the whole drift

Trial area according JKI-guideline 7-1.5 and application area solitary tree (© JKI|Kanne-Schludde)

Material and methods

- Experimental parameters -

Experimental parameters with a cannon sprayer at solitary tree, avenue and forest egde.

Experimental parameters	Solitary tree	Avenue	Forest edge
Liquid rate (l ha^{-1})	895	325	245
Working speed (km h^{-1})	1,3	1,3	1,3
Application time (min:sec)	5:20	10:00	5:00
Treated area (m^2)	520	2800	1800
Application rate per tree (l)	46	10	10

Material and methods

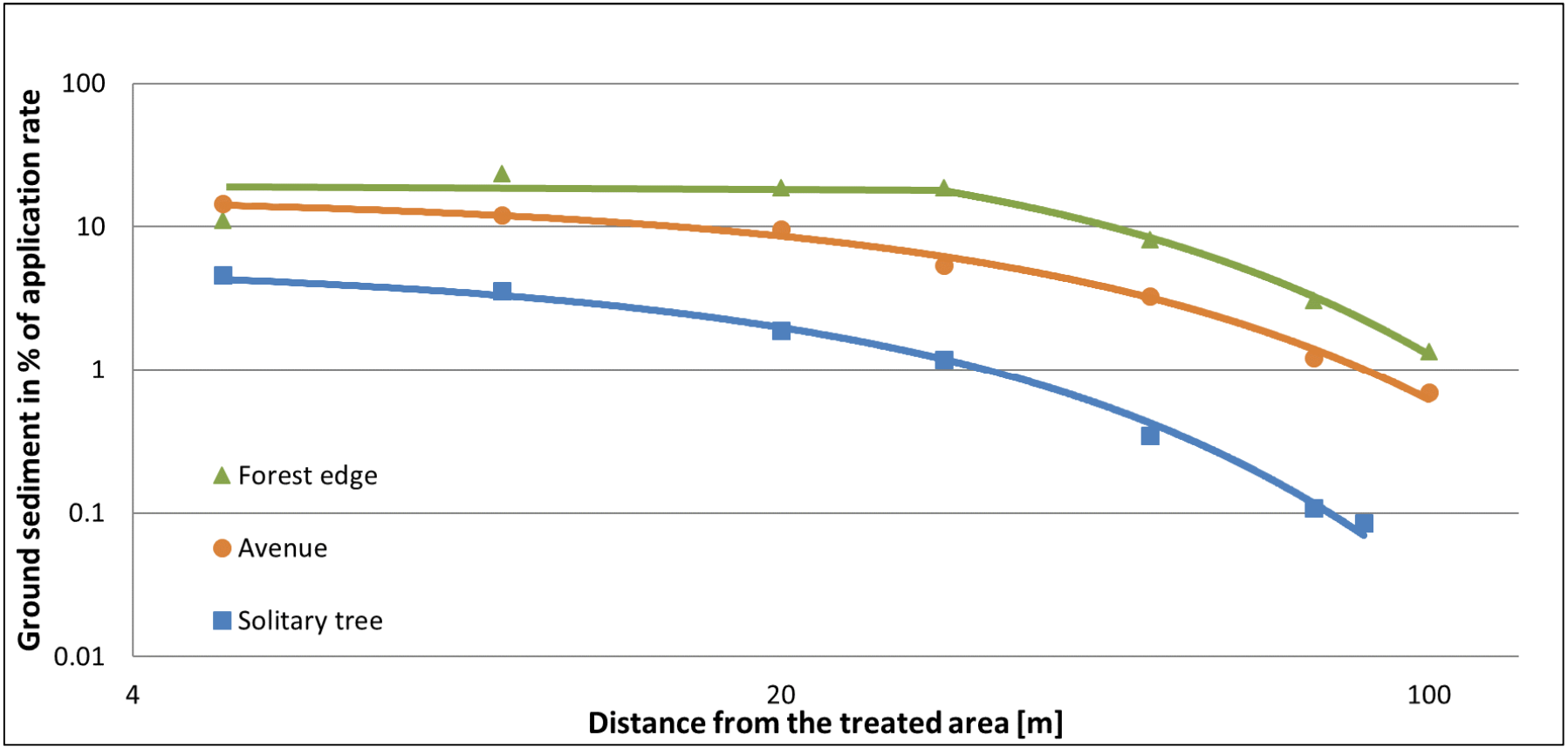
- Analysis of the collectors -

- 40 ml distilled water were added in the petri dishes
- placed on an orbital shaker table (65 rpm for 10 min)
- pyranine concentration in the washing water was measured by fluorometry (excitation 401 und emission 503 nm)
- amount of sprayed deposit per area were calculated using the one-point-calibration (ISO 2005)

Overview in the laboratory: filling of the collectors with 40 ml distilled water, shake for 10 minutes with a shaker and analysis with a flourometer (© JKI|Langkamp-Wedde).

Results

- Measured drift values based on 90th percentile -



Measured drift values in % of the application rate at the cannon sprayer application dependent on the distance to the treated area (Forest edge and the avenue based on the 90th percentile; solitary tree based on maximum values)

Summary and outlook

- 60 000 biocidal products are reported in Germany.
  No general inspection requirements for biocides equipment.
  No information about their environment exposure.
- For PPP, drift values are available, for biocidal products the knowledge of the application accuracy as well as the drift are limited.
- The aim of this research project is to detect and reduce the drift in the spray application of biocides.
- The cannon sprayer showed the highest drift values at the forest edge, slightly lower in the avenue and much lower at a solitary tree.
- The next step is the derivation of basic drift values and the inclusion of these values in the evaluation of biocidal products in the authorization procedure.

Thank you all for listening!

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Material and methods
- Analysis of the collectors -

- Sprayed deposit per area (β_{dep}) and its percentage ($\beta_{dep\%}$) were calculated using ISO 22866:2005
  - in consideration of the measured fluorometer values of the blank samples, the distilled water and the treatment collectors
  - in consideration of the collector size and the tracer concentration in the cannon sprayer tank

$$\beta_{dep} = \frac{\frac{(\rho_{smpl} - \rho_{blk}) * V_{dist}}{\rho_{spray} - \rho_{blk}}}{A_{col} * P_{spray}} \qquad \beta_{dep\%} = \frac{\beta_{dep}}{\beta_V} * 10000$$

- The 90th percentile of the sprayed deposit was used for the evaluation of the drift results

Results

- Basic drift values -

Basic drift values derived from the measured drift values in % of the application rate at the cannon sprayer application dependent to the distance from the treated area based on 90th percentile at forest edge and avenue and based on maximum values at solitary tree.

Distance from the treated area [m]	Forest edge $y = 55.068e^{-0.038x}$	Avenue $y = 16.615e^{-0.033x}$	Solitary tree $y = 5.5339e^{-0.051x}$
5	23.41	14.09	4.29
10	23.41	11.94	3.32
20	23.41	8.59	2.00
30	23.41	6.17	1.20
50	8.24	3.19	0.43
75	3.19	1.40	0.12
85	2.18	1.01	0.07